

# Agisoft Metashape

Processing Report

25 August 2023



# Survey Data

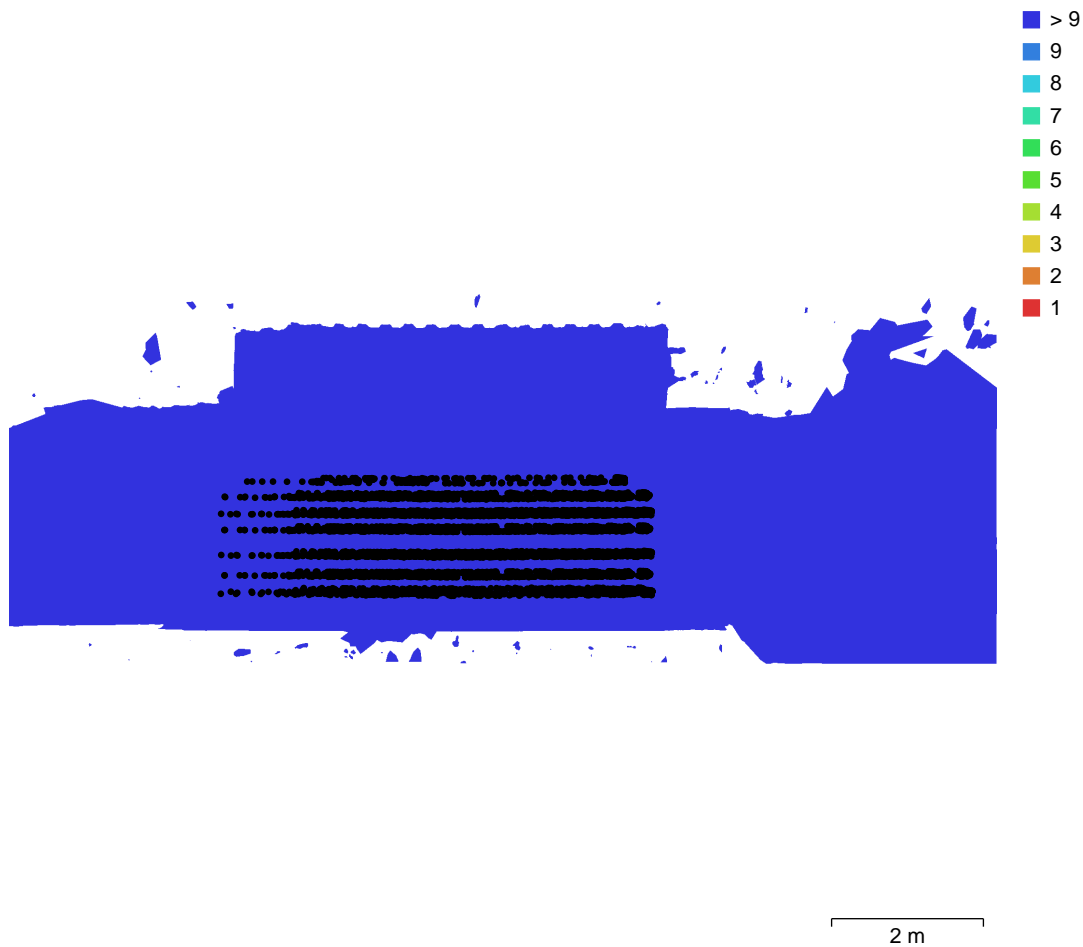


Fig. 1. Camera locations and image overlap.

Number of images:	6,042	Camera stations:	6,042
Flying altitude:	81.5 cm	Tie points:	3,986,555
Ground resolution:	0.508 mm/pix	Projections:	9,990,295
Coverage area:	47.8 m <sup>2</sup>	Reprojection error:	1.12 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Camera 0	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 1	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 2	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 3	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 4	5784 x 8660	12 mm	4.17 x 4.17 um	No

<b>Camera Model</b>	<b>Resolution</b>	<b>Focal Length</b>	<b>Pixel Size</b>	<b>Precalibrated</b>
Camera 5	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 6	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 7	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 8	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 9	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 10	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 11	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 12	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 13	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 14	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 15	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 16	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 17	5784 x 8660	12 mm	4.17 x 4.17 um	No
Camera 18	5784 x 8660	12 mm	4.17 x 4.17 um	No

Table 1. Cameras.

# Camera Calibration

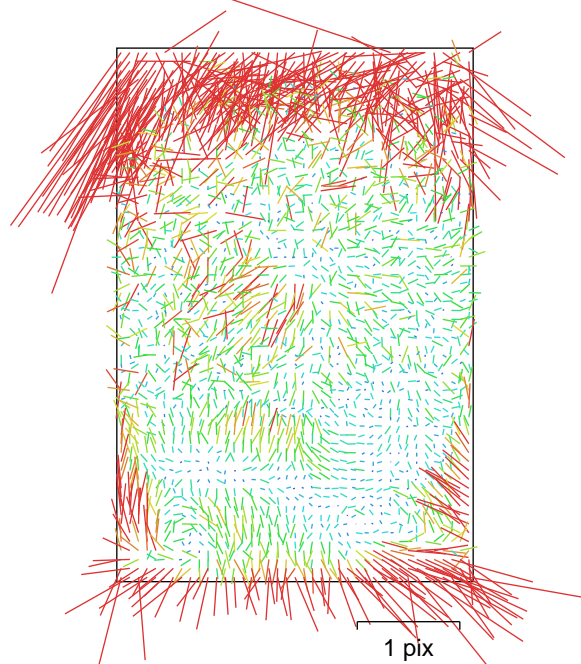


Fig. 2. Image residuals for Camera 0.

## Camera 0

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2954.83</b>	0.031	1.00	0.02	-0.18	-0.83	0.78	-0.70	0.00	0.04
<b>Cx</b>	<b>-19.1178</b>	0.036		1.00	-0.14	0.04	-0.02	0.01	0.85	-0.09
<b>Cy</b>	<b>-19.8519</b>	0.04			1.00	0.04	-0.07	0.07	-0.13	0.74
<b>K1</b>	<b>-0.0331084</b>	2.3e-05				1.00	-0.95	0.89	0.03	-0.07
<b>K2</b>	<b>0.00712746</b>	1.7e-05					1.00	-0.98	-0.02	-0.02
<b>K3</b>	<b>-0.000331304</b>	4e-06						1.00	0.02	0.05
<b>P1</b>	<b>0.000322377</b>	3.5e-06							1.00	-0.08
<b>P2</b>	<b>-0.000434333</b>	3.8e-06								1.00

Table 2. Calibration coefficients and correlation matrix.

# Camera Calibration

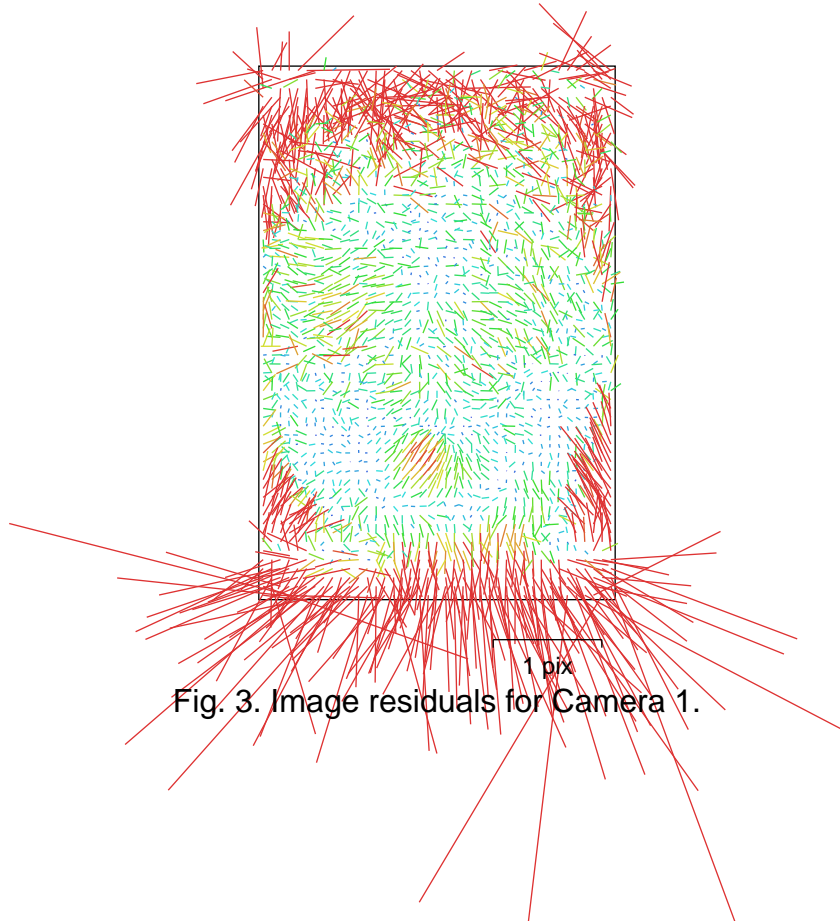


Fig. 3. Image residuals for Camera 1.

## Camera 1

318 images

Type

Resolution

Focal Length

Pixel Size

Frame

**5784 x 8660**

**12 mm**

**4.17 x 4.17 um**

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2959.07</b>	0.028	1.00	0.01	-0.14	-0.78	0.73	-0.65	0.00	0.06
<b>Cx</b>	<b>9.67948</b>	0.036		1.00	0.13	-0.04	0.03	-0.03	0.87	0.08
<b>Cy</b>	<b>29.7419</b>	0.043			1.00	-0.03	-0.04	0.05	0.11	0.77
<b>K1</b>	<b>-0.0301769</b>	2.5e-05				1.00	-0.95	0.88	-0.04	-0.02
<b>K2</b>	<b>0.00447901</b>	2.1e-05					1.00	-0.98	0.03	-0.06
<b>K3</b>	<b>0.000377901</b>	5.6e-06						1.00	-0.03	0.09
<b>P1</b>	<b>-0.000792208</b>	3.8e-06							1.00	0.06
<b>P2</b>	<b>-0.000278051</b>	4.2e-06								1.00

Table 3. Calibration coefficients and correlation matrix.

# Camera Calibration

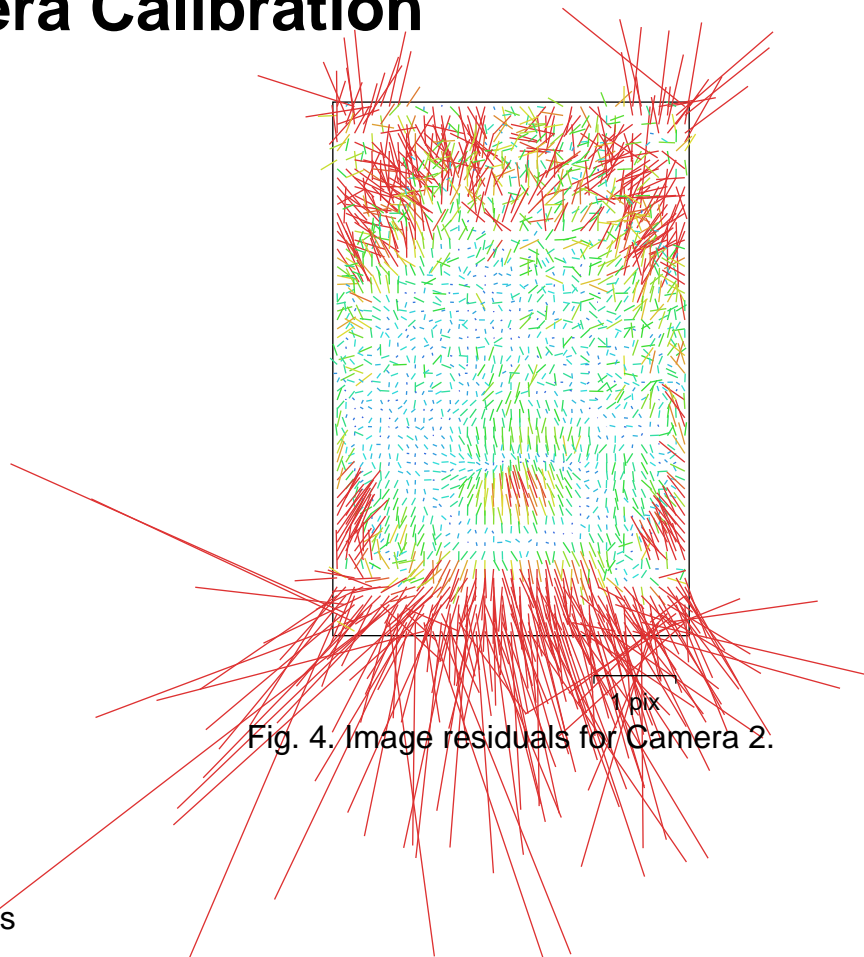


Fig. 4. Image residuals for Camera 2.

**Camera 2**  
318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2958.26</b>	0.028	1.00	0.03	-0.15	-0.72	0.67	-0.58	0.02	0.16
<b>Cx</b>	<b>0.0662288</b>	0.031		1.00	0.03	-0.03	0.03	-0.04	0.82	0.08
<b>Cy</b>	<b>49.7495</b>	0.038			1.00	-0.09	0.03	-0.04	0.02	0.78
<b>K1</b>	<b>-0.0306934</b>	2.3e-05				1.00	-0.96	0.88	-0.02	-0.17
<b>K2</b>	<b>0.00364373</b>	2e-05					1.00	-0.97	0.03	0.08
<b>K3</b>	<b>0.000735605</b>	5.1e-06						1.00	-0.04	-0.04
<b>P1</b>	<b>-0.000985299</b>	3.2e-06							1.00	0.05
<b>P2</b>	<b>-0.000234083</b>	3.7e-06								1.00

Table 4. Calibration coefficients and correlation matrix.

# Camera Calibration

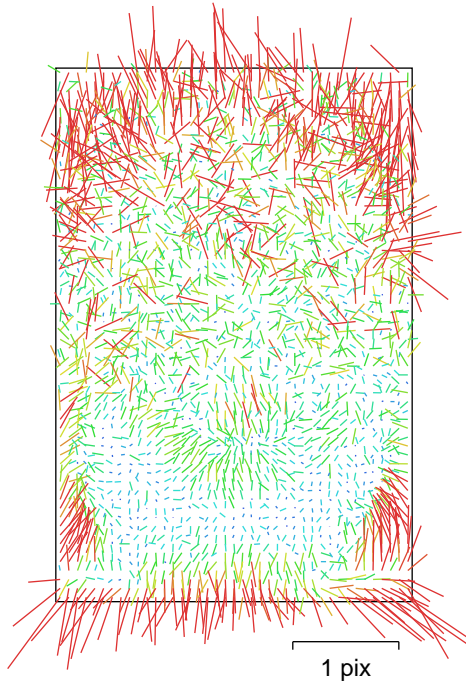


Fig. 5. Image residuals for Camera 3.

## Camera 3

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2973.82</b>	0.027	1.00	-0.01	-0.18	-0.78	0.74	-0.67	-0.01	0.08
<b>Cx</b>	<b>-15.1189</b>	0.027		1.00	-0.03	-0.01	0.00	-0.00	0.82	-0.03
<b>Cy</b>	<b>-17.4394</b>	0.031			1.00	0.01	-0.02	0.02	-0.04	0.74
<b>K1</b>	<b>-0.0340688</b>	1.7e-05				1.00	-0.96	0.90	-0.00	-0.10
<b>K2</b>	<b>0.00840813</b>	1.2e-05					1.00	-0.98	0.00	0.03
<b>K3</b>	<b>-0.000524367</b>	2.7e-06						1.00	-0.00	-0.00
<b>P1</b>	<b>0.000488654</b>	2.5e-06							1.00	-0.05
<b>P2</b>	<b>-0.000178492</b>	3e-06								1.00

Table 5. Calibration coefficients and correlation matrix.

# Camera Calibration

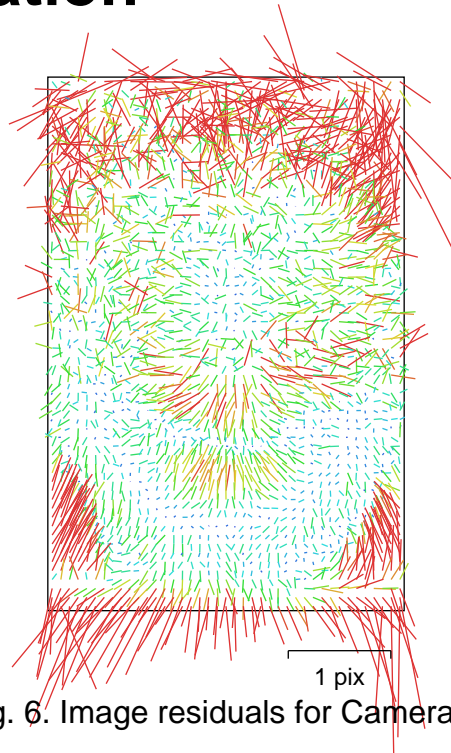


Fig. 6. Image residuals for Camera 4.

## Camera 4

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2970.43</b>	0.024	1.00	0.01	-0.21	-0.73	0.71	-0.65	0.01	0.01
<b>Cx</b>	<b>-9.5145</b>	0.029		1.00	-0.07	0.02	-0.01	0.02	0.86	-0.03
<b>Cy</b>	<b>-4.85082</b>	0.038			1.00	-0.05	-0.03	0.05	-0.05	0.81
<b>K1</b>	<b>-0.0311604</b>	1.7e-05				1.00	-0.95	0.90	0.02	-0.09
<b>K2</b>	<b>0.00672126</b>	1.2e-05					1.00	-0.98	-0.02	-0.02
<b>K3</b>	<b>-0.000189302</b>	2.8e-06						1.00	0.03	0.05
<b>P1</b>	<b>0.000718691</b>	2.8e-06							1.00	-0.00
<b>P2</b>	<b>-0.000212449</b>	3.6e-06								1.00

Table 6. Calibration coefficients and correlation matrix.



# Camera Calibration

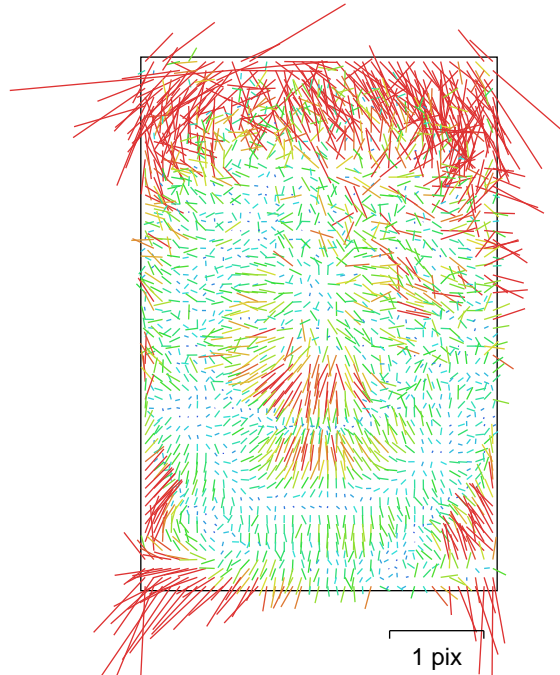


Fig. 7. Image residuals for Camera 5.

## Camera 5

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2958.45</b>	0.024	1.00	-0.01	-0.21	-0.76	0.73	-0.66	-0.02	0.05
<b>Cx</b>	<b>30.7289</b>	0.028		1.00	0.08	-0.03	0.02	-0.01	0.83	0.05
<b>Cy</b>	<b>55.3348</b>	0.033			1.00	-0.02	-0.03	0.04	0.08	0.78
<b>K1</b>	<b>-0.0331359</b>	1.6e-05				1.00	-0.96	0.90	0.00	-0.13
<b>K2</b>	<b>0.00765635</b>	1.1e-05					1.00	-0.98	0.00	0.02
<b>K3</b>	<b>-0.000380348</b>	2.6e-06						1.00	-0.00	0.01
<b>P1</b>	<b>-0.000775983</b>	2.6e-06							1.00	0.04
<b>P2</b>	<b>0.000171531</b>	3.1e-06								1.00

Table 7. Calibration coefficients and correlation matrix.

# Camera Calibration

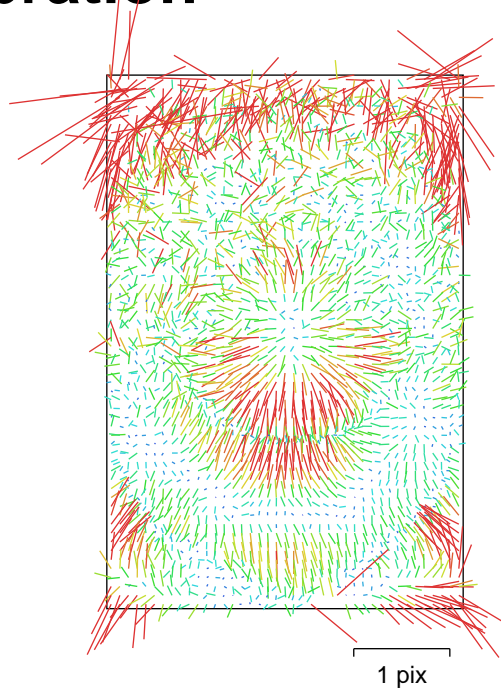


Fig. 8. Image residuals for Camera 6.

## Camera 6

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2958.92</b>	0.024	1.00	-0.00	-0.24	-0.67	0.66	-0.59	0.01	0.03
<b>Cx</b>	<b>-28.6434</b>	0.028		1.00	-0.09	0.05	-0.05	0.04	0.81	-0.04
<b>Cy</b>	<b>-18.3971</b>	0.031			1.00	-0.04	-0.02	0.03	-0.09	0.77
<b>K1</b>	<b>-0.0352911</b>	1.4e-05				1.00	-0.95	0.89	0.02	-0.18
<b>K2</b>	<b>0.00885134</b>	9.6e-06					1.00	-0.98	-0.02	0.05
<b>K3</b>	<b>-0.000580695</b>	2.1e-06						1.00	0.02	-0.01
<b>P1</b>	<b>0.000257364</b>	2.4e-06							1.00	-0.03
<b>P2</b>	<b>0.000357043</b>	2.9e-06								1.00

Table 8. Calibration coefficients and correlation matrix.

# Camera Calibration

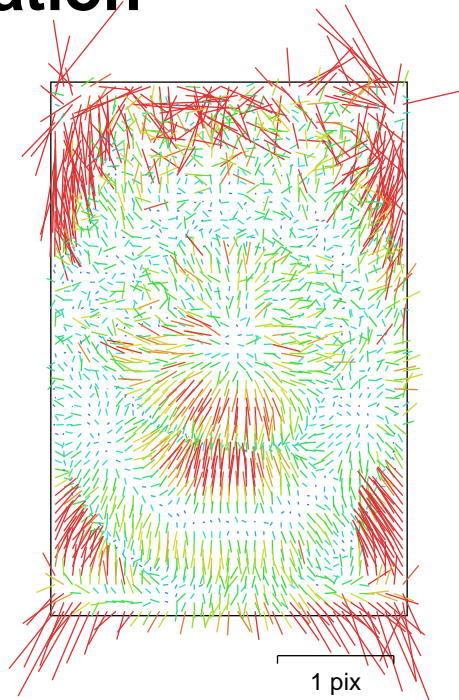


Fig. 9. Image residuals for Camera 7.

## Camera 7

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2964.15</b>	0.021	1.00	-0.02	-0.30	-0.58	0.59	-0.53	-0.04	0.01
<b>Cx</b>	<b>19.776</b>	0.024		1.00	0.08	-0.04	0.03	-0.04	0.81	0.03
<b>Cy</b>	<b>21.3917</b>	0.032			1.00	-0.13	0.03	-0.01	0.05	0.79
<b>K1</b>	<b>-0.0331863</b>	1.3e-05				1.00	-0.95	0.89	-0.02	-0.24
<b>K2</b>	<b>0.00771913</b>	9.2e-06					1.00	-0.98	0.02	0.09
<b>K3</b>	<b>-0.00032494</b>	2.1e-06						1.00	-0.03	-0.05
<b>P1</b>	<b>-0.000301325</b>	2.1e-06							1.00	-0.01
<b>P2</b>	<b>0.000267362</b>	2.8e-06								1.00

Table 9. Calibration coefficients and correlation matrix.

# Camera Calibration

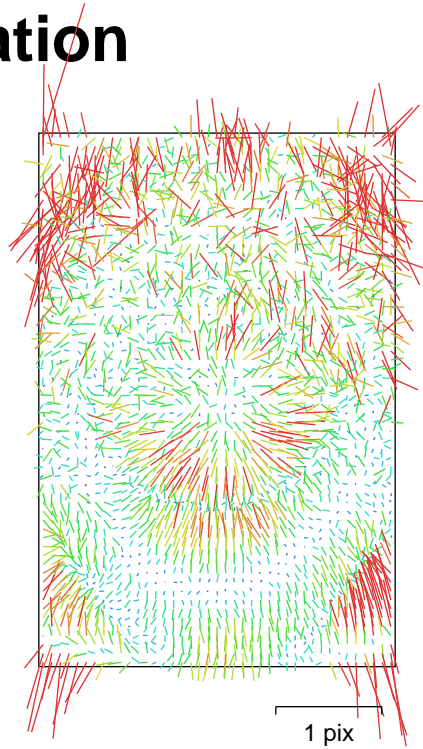


Fig. 10. Image residuals for Camera 8.

## Camera 8

318 images

Type

Resolution

Focal Length

Pixel Size

Frame

**5784 x 8660**

**12 mm**

**4.17 x 4.17 um**

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2959.52</b>	0.023	1.00	-0.00	-0.26	-0.68	0.67	-0.62	-0.01	-0.00
<b>Cx</b>	<b>28.2165</b>	0.024		1.00	-0.02	0.02	-0.01	0.01	0.78	-0.03
<b>Cy</b>	<b>18.3924</b>	0.028			1.00	-0.04	-0.00	0.00	-0.04	0.74
<b>K1</b>	<b>-0.0355102</b>	1.3e-05				1.00	-0.95	0.89	0.03	-0.18
<b>K2</b>	<b>0.00927039</b>	8.8e-06					1.00	-0.98	-0.01	0.06
<b>K3</b>	<b>-0.000647394</b>	1.8e-06						1.00	-0.00	-0.04
<b>P1</b>	<b>-0.000691875</b>	2.1e-06							1.00	-0.07
<b>P2</b>	<b>-0.000167158</b>	2.6e-06								1.00

Table 10. Calibration coefficients and correlation matrix.

# Camera Calibration

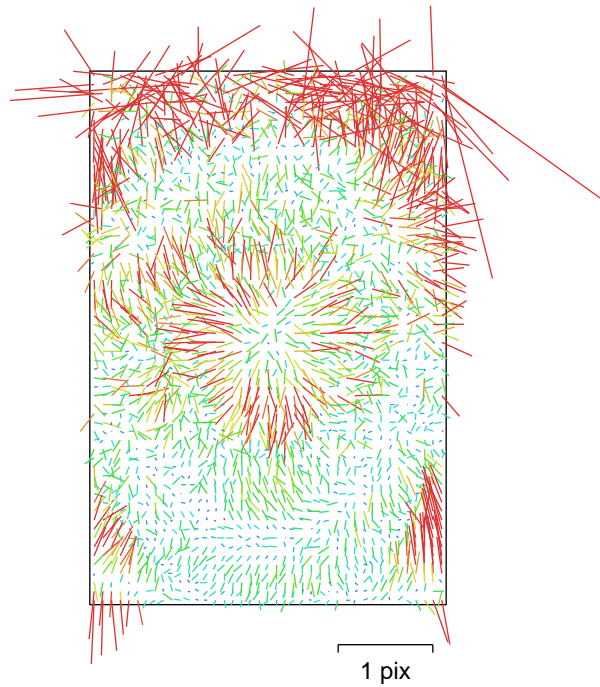


Fig. 11. Image residuals for Camera 9.

## Camera 9

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2952.8</b>	0.032	1.00	0.00	-0.12	-0.80	0.74	-0.67	0.01	0.03
<b>Cx</b>	<b>-23.5863</b>	0.025		1.00	0.01	0.01	-0.00	0.01	0.71	0.01
<b>Cy</b>	<b>-8.8707</b>	0.032			1.00	-0.00	0.04	-0.06	0.02	0.69
<b>K1</b>	<b>-0.0380327</b>	1.9e-05				1.00	-0.96	0.90	0.00	-0.06
<b>K2</b>	<b>0.0111288</b>	1.2e-05					1.00	-0.98	-0.00	0.01
<b>K3</b>	<b>-0.00103283</b>	2.4e-06						1.00	0.00	-0.00
<b>P1</b>	<b>0.000480464</b>	2.4e-06							1.00	0.02
<b>P2</b>	<b>7.77843e-05</b>	3e-06								1.00

Table 11. Calibration coefficients and correlation matrix.

# Camera Calibration

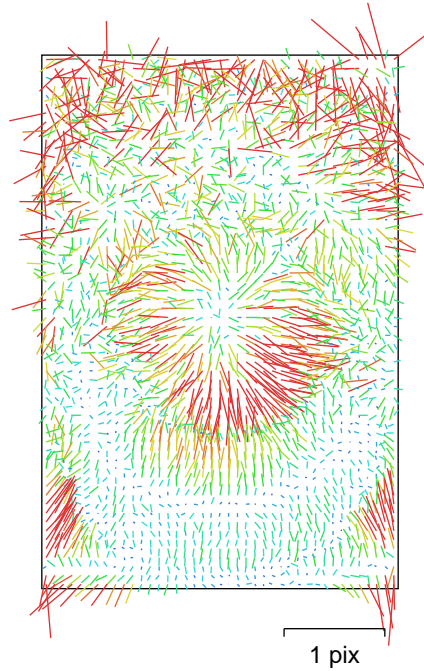


Fig. 12. Image residuals for Camera 10.

## Camera 10

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2964.84</b>	0.027	1.00	0.01	-0.20	-0.77	0.74	-0.68	0.02	-0.05
<b>Cx</b>	<b>-15.6551</b>	0.025		1.00	-0.03	0.01	-0.01	0.01	0.79	-0.01
<b>Cy</b>	<b>-13.4843</b>	0.033			1.00	-0.02	0.01	-0.02	-0.02	0.78
<b>K1</b>	<b>-0.0354611</b>	1.6e-05				1.00	-0.96	0.91	0.01	-0.08
<b>K2</b>	<b>0.0101994</b>	1e-05					1.00	-0.99	-0.01	0.00
<b>K3</b>	<b>-0.000847591</b>	2e-06						1.00	0.01	0.01
<b>P1</b>	<b>-3.93979e-05</b>	2.2e-06							1.00	0.01
<b>P2</b>	<b>-0.000355028</b>	3e-06								1.00

Table 12. Calibration coefficients and correlation matrix.

# Camera Calibration

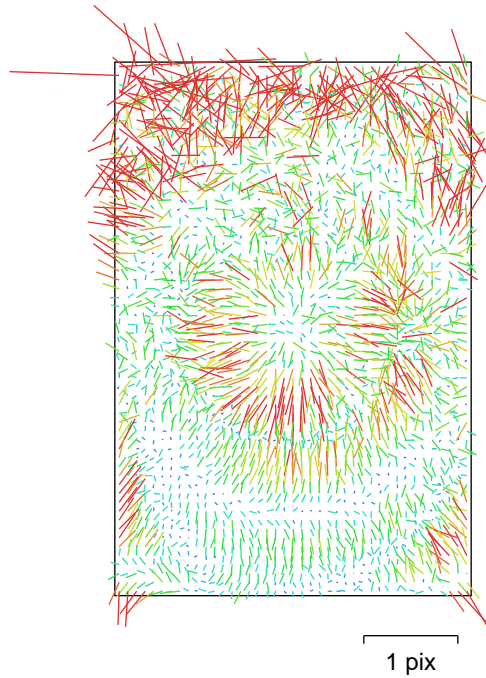


Fig. 13. Image residuals for Camera 11.

## Camera 11

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2960.65</b>	0.027	1.00	-0.02	-0.17	-0.78	0.73	-0.66	-0.03	-0.02
<b>Cx</b>	<b>21.2555</b>	0.025		1.00	0.03	-0.02	0.03	-0.03	0.75	-0.04
<b>Cy</b>	<b>28.8559</b>	0.031			1.00	0.00	0.02	-0.03	0.04	0.74
<b>K1</b>	<b>-0.0362071</b>	1.6e-05				1.00	-0.96	0.90	-0.01	-0.07
<b>K2</b>	<b>0.0100722</b>	1.1e-05					1.00	-0.98	0.02	0.00
<b>K3</b>	<b>-0.000815982</b>	2.1e-06						1.00	-0.03	0.02
<b>P1</b>	<b>-0.000483573</b>	2.2e-06							1.00	-0.04
<b>P2</b>	<b>-0.000154876</b>	2.8e-06								1.00

Table 13. Calibration coefficients and correlation matrix.

# Camera Calibration

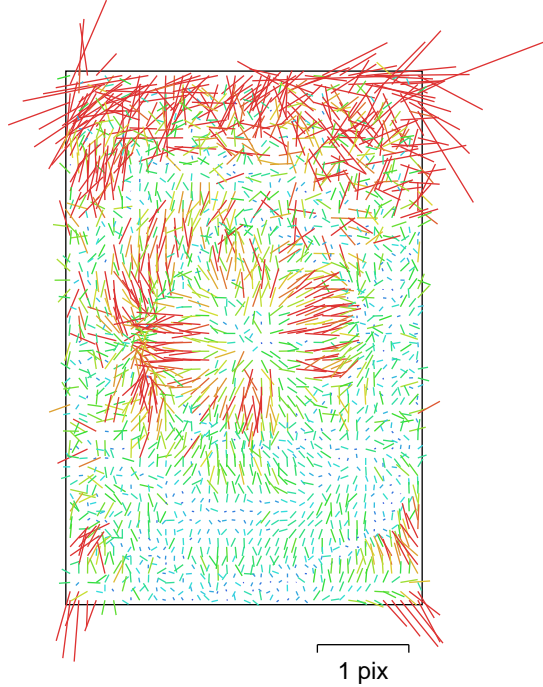


Fig. 14. Image residuals for Camera 12.

## Camera 12

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2955.88</b>	0.034	1.00	0.04	-0.10	-0.80	0.73	-0.65	0.03	0.02
<b>Cx</b>	<b>-22.8718</b>	0.031		1.00	-0.02	0.02	-0.03	0.03	0.69	0.06
<b>Cy</b>	<b>-10.9544</b>	0.039			1.00	0.04	-0.01	0.00	-0.00	0.76
<b>K1</b>	<b>-0.0359967</b>	2.2e-05				1.00	-0.96	0.90	-0.00	-0.03
<b>K2</b>	<b>0.0101253</b>	1.5e-05					1.00	-0.98	-0.01	-0.02
<b>K3</b>	<b>-0.000840396</b>	3.1e-06						1.00	0.01	0.04
<b>P1</b>	<b>0.000236888</b>	2.8e-06							1.00	0.08
<b>P2</b>	<b>-4.81042e-05</b>	3.7e-06								1.00

Table 14. Calibration coefficients and correlation matrix.



# Camera Calibration

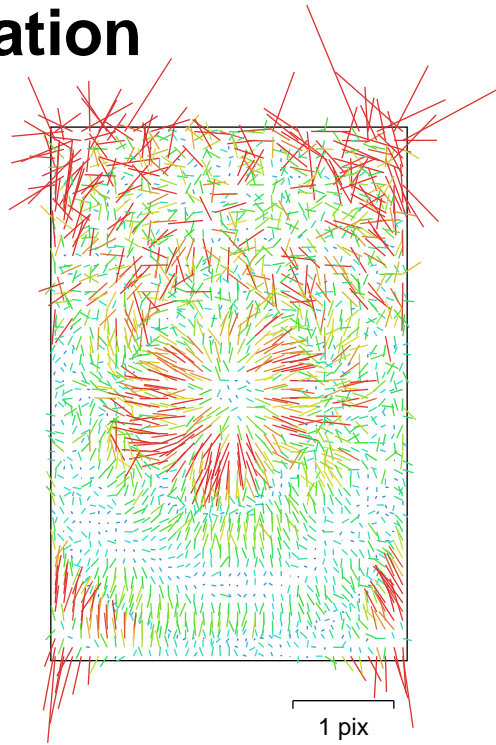


Fig. 15. Image residuals for Camera 13.

## Camera 13

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2946.79</b>	0.027	1.00	-0.01	-0.15	-0.77	0.73	-0.66	-0.02	-0.06
<b>Cx</b>	<b>13.1125</b>	0.027		1.00	-0.04	-0.01	0.01	-0.02	0.76	-0.06
<b>Cy</b>	<b>28.847</b>	0.035			1.00	0.05	-0.03	0.02	-0.09	0.78
<b>K1</b>	<b>-0.0362759</b>	1.7e-05				1.00	-0.95	0.89	-0.01	-0.01
<b>K2</b>	<b>0.0101385</b>	1.2e-05					1.00	-0.98	0.02	-0.06
<b>K3</b>	<b>-0.000825996</b>	2.4e-06						1.00	-0.03	0.06
<b>P1</b>	<b>-0.00020336</b>	2.4e-06							1.00	-0.12
<b>P2</b>	<b>0.000188252</b>	3.3e-06								1.00

Table 15. Calibration coefficients and correlation matrix.

# Camera Calibration

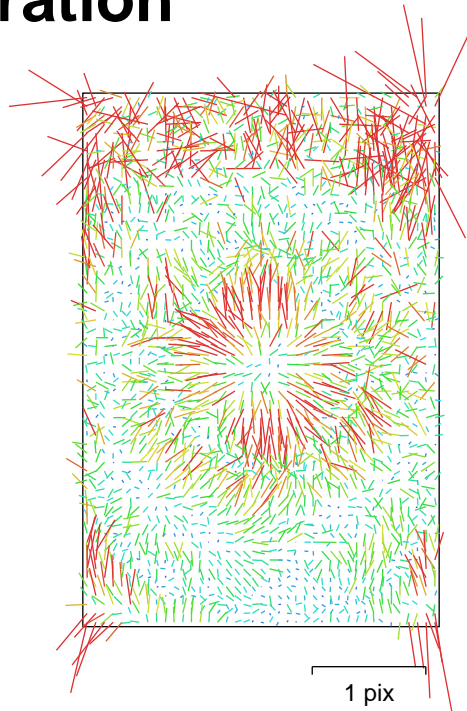


Fig. 16. Image residuals for Camera 14.

## Camera 14

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2964.63</b>	0.03	1.00	0.02	-0.12	-0.79	0.72	-0.65	-0.00	0.00
<b>Cx</b>	<b>18.4267</b>	0.024		1.00	0.00	-0.01	0.01	-0.01	0.67	0.00
<b>Cy</b>	<b>46.3932</b>	0.031			1.00	0.00	0.03	-0.04	-0.00	0.73
<b>K1</b>	<b>-0.036881</b>	1.8e-05				1.00	-0.96	0.91	0.00	-0.03
<b>K2</b>	<b>0.0108395</b>	1.2e-05					1.00	-0.98	0.00	-0.01
<b>K3</b>	<b>-0.000936962</b>	2.5e-06						1.00	-0.00	0.01
<b>P1</b>	<b>-0.000356566</b>	2.2e-06							1.00	-0.02
<b>P2</b>	<b>0.000199326</b>	2.8e-06								1.00

Table 16. Calibration coefficients and correlation matrix.

# Camera Calibration

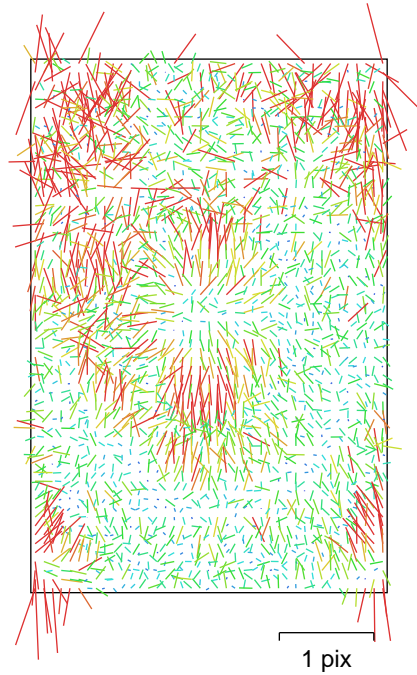


Fig. 17. Image residuals for Camera 15.

## Camera 15

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2966.83</b>	0.039	1.00	-0.00	-0.04	-0.81	0.74	-0.66	-0.01	0.03
<b>Cx</b>	<b>-8.3401</b>	0.029		1.00	0.03	0.01	-0.01	0.02	0.64	0.03
<b>Cy</b>	<b>-23.9069</b>	0.039			1.00	-0.00	0.03	-0.02	0.04	0.72
<b>K1</b>	<b>-0.0364862</b>	2.6e-05				1.00	-0.96	0.91	0.01	-0.02
<b>K2</b>	<b>0.0108909</b>	1.8e-05					1.00	-0.98	-0.02	-0.02
<b>K3</b>	<b>-0.000961538</b>	3.8e-06						1.00	0.02	0.03
<b>P1</b>	<b>0.00066188</b>	2.9e-06							1.00	0.06
<b>P2</b>	<b>-0.000225422</b>	3.7e-06								1.00

Table 17. Calibration coefficients and correlation matrix.

# Camera Calibration

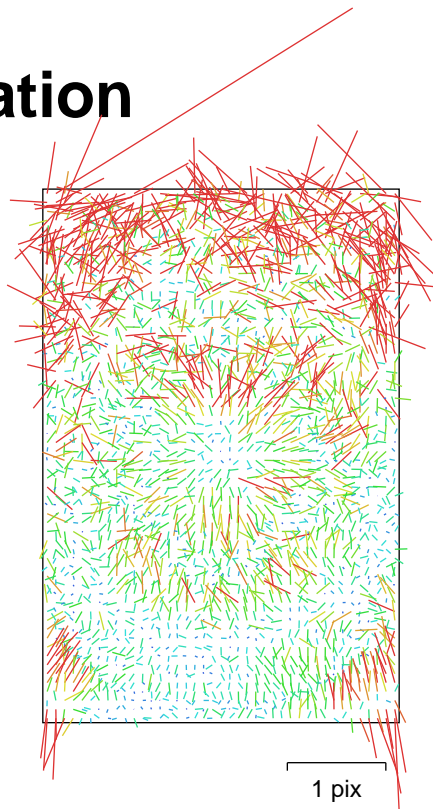


Fig. 18. Image residuals for Camera 16.

## Camera 16

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2951.35</b>	0.038	1.00	0.02	-0.06	-0.81	0.75	-0.67	0.05	-0.03
<b>Cx</b>	<b>-9.75623</b>	0.032		1.00	0.07	-0.02	0.01	0.00	0.75	0.09
<b>Cy</b>	<b>-11.8281</b>	0.041			1.00	0.04	0.01	-0.02	0.08	0.73
<b>K1</b>	<b>-0.0376117</b>	2.4e-05				1.00	-0.96	0.90	-0.05	0.01
<b>K2</b>	<b>0.0108792</b>	1.5e-05					1.00	-0.98	0.02	-0.06
<b>K3</b>	<b>-0.000976829</b>	3.1e-06						1.00	-0.01	0.06
<b>P1</b>	<b>0.000311296</b>	3e-06							1.00	0.12
<b>P2</b>	<b>-8.3119e-05</b>	3.9e-06								1.00

Table 18. Calibration coefficients and correlation matrix.

# Camera Calibration

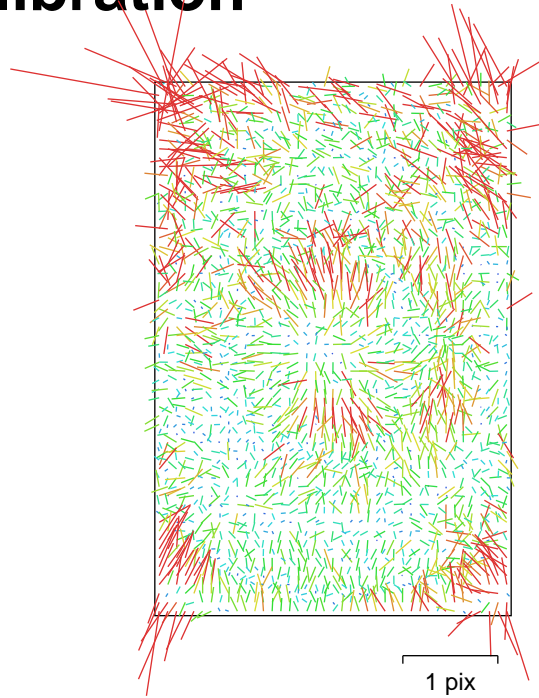


Fig. 19. Image residuals for Camera 17.

## Camera 17

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2959.92</b>	0.037	1.00	-0.02	-0.03	-0.81	0.74	-0.67	-0.03	0.01
<b>Cx</b>	<b>21.4978</b>	0.031		1.00	-0.06	-0.01	0.01	-0.01	0.67	-0.10
<b>Cy</b>	<b>42.1736</b>	0.041			1.00	0.00	0.01	-0.00	-0.07	0.80
<b>K1</b>	<b>-0.0362127</b>	2.6e-05				1.00	-0.96	0.91	0.02	-0.01
<b>K2</b>	<b>0.0104164</b>	1.8e-05					1.00	-0.98	-0.01	-0.03
<b>K3</b>	<b>-0.000843942</b>	3.9e-06						1.00	0.01	0.03
<b>P1</b>	<b>-0.000179799</b>	3e-06							1.00	-0.11
<b>P2</b>	<b>0.000361033</b>	4e-06								1.00

Table 19. Calibration coefficients and correlation matrix.

# Camera Calibration

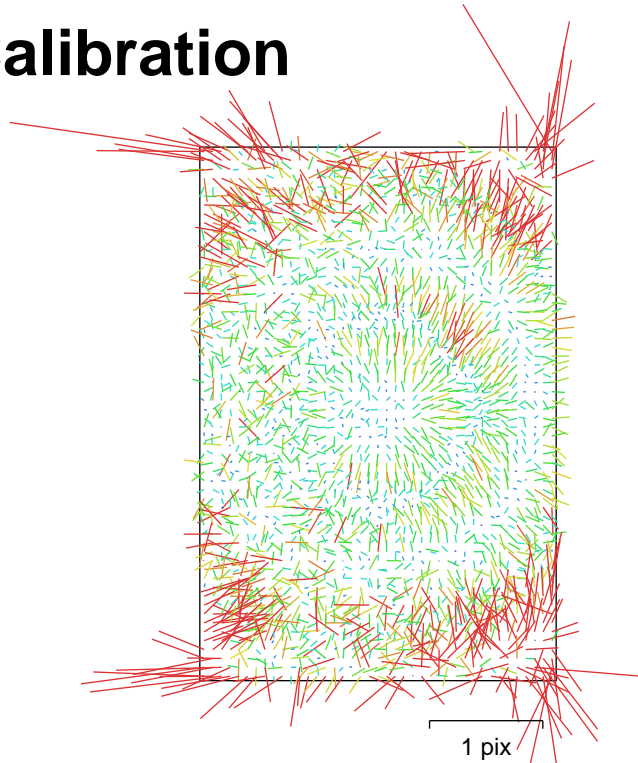


Fig. 20. Image residuals for Camera 18.

## Camera 18

318 images

Type	Resolution	Focal Length	Pixel Size
Frame	<b>5784 x 8660</b>	<b>12 mm</b>	<b>4.17 x 4.17 um</b>

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
<b>F</b>	<b>2955.54</b>	0.048	1.00	-0.47	0.03	-0.40	0.36	-0.31	0.10	0.01
<b>Cx</b>	<b>-22.7367</b>	0.048		1.00	-0.05	0.02	-0.00	0.00	0.34	-0.04
<b>Cy</b>	<b>-38.331</b>	0.041			1.00	0.00	-0.01	0.01	-0.04	0.84
<b>K1</b>	<b>-0.0339411</b>	2.3e-05				1.00	-0.95	0.88	-0.14	0.01
<b>K2</b>	<b>0.00845777</b>	1.9e-05					1.00	-0.98	0.07	-0.01
<b>K3</b>	<b>-0.000441599</b>	4.4e-06						1.00	-0.04	0.00
<b>P1</b>	<b>9.18616e-05</b>	3.5e-06							1.00	-0.06
<b>P2</b>	<b>-0.000220959</b>	4.2e-06								1.00

Table 20. Calibration coefficients and correlation matrix.

# Scale Bars

<b>Label</b>	<b>Distance (m)</b>	<b>Error (m)</b>
003. 7-8	0.250248	0.000187892
006. 15-16	0.25014	0.000109933
009. 23-24	0.249826	-0.000293891
002a. 4-5	0.249921	-7.85274e-05
002b. 5-6	0.249764	-0.000136473
005a. 12-13	0.249948	-3.17836e-05
005b. 13-14	0.250028	0.000138352
008a. 20-21	0.249901	-0.000129499
008b. 21-22	0.25011	0.000229614
<b>Total</b>		<b>0.000166064</b>

Table 21. Control scale bars.

# Digital Elevation Model

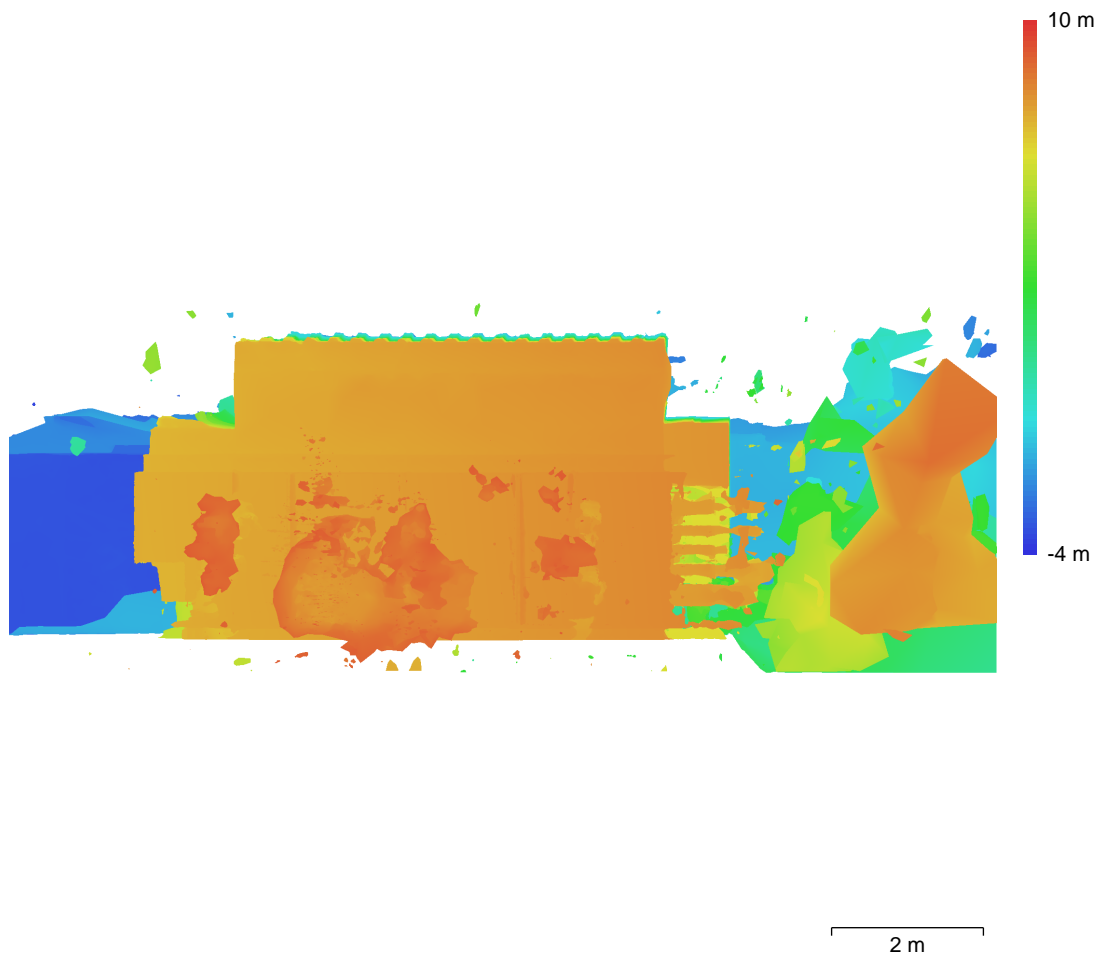


Fig. 21. Reconstructed digital elevation model.

Resolution: 7.2 mm/pix  
Point density: 1.93 points/cm<sup>2</sup>



# Processing Parameters

## General

Cameras	6042
Aligned cameras	6042
Markers	15
Scale bars	9
Coordinate system	Local Coordinates (m)
Rotation angles	Yaw, Pitch, Roll

## Tie Points

Points	3,986,555 of 10,128,482
RMS reprojection error	0.399158 (1.12447 pix)
Max reprojection error	1.92083 (13.1705 pix)
Mean key point size	2.70452 pix
Point colors	3 bands, uint8
Key points	28.63 GB
Average tie point multiplicity	3.82764

## Alignment parameters

Accuracy	Highest
Generic preselection	Yes
Reference preselection	Estimated
Key point limit	60,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	No
Matching time	3 hours 36 minutes
Matching memory usage	5.17 GB
Alignment time	1 hours 9 minutes
Alignment memory usage	16.65 GB

## Optimization parameters

Parameters	f, cx, cy, k1-k3, p1, p2
Adaptive camera model fitting	No
Optimization time	24 seconds
Date created	2023:08:24 22:49:18
Software version	2.0.2.16404
File size	860.58 MB

## Depth Maps

Count	5956
-------	------

## Depth maps generation parameters

Quality	Medium
Filtering mode	Mild
Max neighbors	16
Processing time	2 hours 28 minutes
Memory usage	5.99 GB
Date created	2023:08:25 06:09:51
Software version	2.0.2.16404
File size	15.78 GB

## Point Cloud

Points	287,946,931
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## Point attributes

Color	3 bands, uint8
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Normal

**Point classes**

Created (never classified) 287,946,931

**Depth maps generation parameters**

Quality Medium  
Filtering mode Mild  
Max neighbors 16  
Processing time 2 hours 28 minutes  
Memory usage 5.99 GB

**Point cloud generation parameters**

Processing time 13 hours 2 minutes  
Memory usage 101.80 GB  
Date created 2023:08:25 19:16:26  
Software version 2.0.2.16404  
File size 3.76 GB

**Model**

Faces 1,754,291  
Vertices 885,231  
Vertex colors 3 bands, uint8  
Texture 16,384 x 16,384, 4 bands, uint8

**Depth maps generation parameters**

Quality Medium  
Filtering mode Mild  
Max neighbors 16  
Processing time 2 hours 28 minutes  
Memory usage 5.99 GB

**Reconstruction parameters**

Surface type Arbitrary  
Source data Depth maps  
Interpolation Enabled  
Strict volumetric masks No  
Processing time 44 minutes 2 seconds  
Memory usage 12.77 GB

**Texturing parameters**

Mapping mode Generic  
Blending mode Mosaic  
Texture size 16,384  
Enable hole filling Yes  
Enable ghosting filter Yes  
UV mapping time 6 minutes 9 seconds  
UV mapping memory usage 1.20 GB  
Blending time 41 minutes 42 seconds  
Blending memory usage 11.29 GB  
Blending GPU memory usage 7.55 GB  
Date created 2023:08:25 20:03:02  
Software version 2.0.2.16404  
File size 277.72 MB

**System**

Software name Agisoft Metashape Professional  
Software version 2.0.2 build 16404  
OS Windows 64 bit  
RAM 255.87 GB  
CPU AMD Ryzen Threadripper 3970X 32-Core Processor  
GPU(s) NVIDIA GeForce RTX 3090  
NVIDIA GeForce RTX 3090  
NVIDIA GeForce RTX 3090